

THE INFLUENCE OF CLIMATE CHANGE ON THE EFFICIENCY OF AGRICULTURE

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ABSTRACT

In present, the effects of climate change on agricultural crops necessary for food security are becoming increasingly apparent and in the last few years there have been negative manifestations that have led to declining agricultural productivity. Therefore, as a result of this decline in agricultural productivity, changes in consumer prices and trade in comparative advantage occurred. This article aims to correlate the biophysical and socio-economic indicators in order to create an overall picture of the influence of climate change on agricultural efficiency. Climate change is different from one area to another and at regional level these changes and their effects may be less visible. However, variability and climate change can lead to the degradation of food security, especially in vulnerable areas. In this way, it is desirable to attract investments from internal or external funds for adaptation to climate change, as well as avoiding harmful effects on the agricultural crops and local communities. The main factors that can influence the current state of agriculture are of a biological, physical and socio-economic nature. So, it can be stated that crop production can be affected by biophysical factors through temperature variation, temperature increase, rainfall regime change, and increased atmospheric carbon dioxide. Consequently, adaptation to climate change has the role of helping to reduce the number of negative effects due to changes hoping to improve the positive environmental impacts.

KEYWORDS: *climate change, agricultural efficiency, food security, socio-economic and biophysical indicators*

JEL CLASSIFICATION: *010, 013, O44, P28*

1. INTRODUCTION

According to the FAO report (2017), the agricultural sector is becoming the focal point and gets special attention because must adapt to climate change. Among the objectives of the Paris Agreement COP21 (2015) including food safety and security, as well as ending hunger in poorly developed countries due to the effects of climate change which can contribute to decreased agricultural production. The Marrakech Proclamation of Action for Climate and Sustainable Development (2017) issued by the Heads of State and Government of Marrakech, Morocco at COP22 (2017), "Calls on all parties to strengthen and support efforts to eradicate poverty, to ensure food security and the adoption of strict measures to deal with challenges related to climate change in agriculture".

Agricultural efficiency is closely related to productivity because agricultural crops are growing normally leading to significant productions to ensure the necessity of food, but some researchers,

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such as Grosskopf (2002) said this hypothesis could be supported only when the "farm / agricultural company is technically efficient".

Climate change adaptation measures have been implemented over time and human communities have had to adapt to the current environment. According to the IPCC (2012), currently increasing the amount of greenhouse gas emissions from human activities led to temperature increases of up to 0.8°C above pre-industrial levels, all of which favored the emergence of extreme weather phenomena. Because, current agreements and conventions have as their primary purpose reducing greenhouse gas emissions, but also to keep global average temperature up to 2°C. The measures adopted in the past in order to maintain the current climate they can no longer cope with the rapid pace of the changes and the intensity of the extreme meteorological phenomena, "and in many cases, these measures may no longer be sufficient to adapt to climate change" (Bierbaum et al., 2013).

According to other researchers (Kovats et al, 2014) regarding to the main pressures on agriculture resulting from climate change, these are represented by temperature variations, water availability, the emergence of drought, the presence and persistence of pests or diseases. In this regard, the fifth IPCC report exemplifies a comprehensive impact assessment that may arise in the future due to climate change in Europe which have a direct effect on the agricultural sector and production processes.

2. DISCUSSION

For the purpose of writing this article account has been taken of the importance of this subject, but also by socio-economic indicators and the role of efficiency in agriculture on current climate change. Therefore, the need to address this issue is represented by awareness of the role of efficiency in agriculture in the context of climate change. Further, will be briefly debated climate change legal concepts, the typology of agricultural activities, the role of efficiency as an economic indicator, but also the current and future situation in the context of climate change. The overall objective of this article is to highlight the role of efficiency in agricultural activities in the context of climate change.

By adopting the Paris Agreement on Climate Change the signatory parties argue that support for the implementation of long-term objectives is of particular importance and therefore, requires coordinated and effective actions to achieve the desired results (for example, better sustainable development and the eradication of poverty and hunger). This agreement provides for the promotion of mitigation and adaptation measures, improving public and private sector participation in implementing appropriate national solutions; as well as creating opportunities for coordination between user tools and institutional arrangements.

2.1. Legislative concepts on climate change

At global level there are the following agreements between the partner states:

United Nations Framework Convention on Climate Change (UNFCCC). This convention was established in 1992 having the role of a decision-making forum for international action on climate change and 197 countries have joined this international agreement. Its main purpose is to achieve or maintains greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. Such a level should be achieved within a period of time sufficient to allow ecosystems to adapt naturally to climate change, to ensure the necessary food production and to enable sustainable economic development.

Under the ***Kyoto Protocol*** adopted at international level it was hoped that 37 industrialized countries in 2008-2012 to meet the criteria for reducing greenhouse gas emissions by an average of 5% compared to 1990 limits. The UK has also committed to reducing its greenhouse gas emissions by 12.5%. The proposed objective was achieved and the 37 countries have managed to reduce their greenhouse gas emissions by more than 10%. But, there are still countries where greenhouse gas emissions have increased over the period 2008-2012, for example China. This Kyoto Protocol has

been prolonged for the period 2013-2020, but the signatory countries have ratified in a smaller number than the original ones.

The Paris Agreement. The UNFCCC has continued the negotiations with the involved states and the result was the adoption of the Paris Agreement in 2015. Significant efforts have been made to sign this agreement at global level to reduce greenhouse gas emissions. So, 160 UNFCCC stakeholders have committed themselves to reducing their greenhouse gas emissions by 2030, including China, the US and the European Union. The main objective of the Paris Agreement is to avoid a global average temperature rise of more than 2°C above pre-industrial levels and to continue efforts to limit global warming to 1.5°C. The Paris Agreement provides for a review of commitments in 2018, and another review will take place in 2023, also, additional reviews every five years after this last deadline.

As regards national legislation, Romania respects the international legislative provisions, but also on existing national ones, such as:

- Decision no. 1026/2014 for the reorganization of the National Commission on Climate Change. The National Commission on Climate Change is an interministerial body, with advisory role, without legal personality, whose activity is coordinated by the central public authority for environmental protection and climate change.
- Decision approving the National Climate Change Strategy and economic growth based on low carbon emissions for the period 2016-2020 and the National Action Plan for Implementation National Strategy on Climate Change and economic growth based on low carbon emissions for the period 2016-2020.

2.2. The typology of agricultural activities

In the figure below (Figure 1) is the distribution of the population in the European Union according to the media they are part of, ie rural or urban from 2012. The average share of the population in rural areas was 22.3% and this was influenced by lower values in some developed countries, such as the United Kingdom where only 2.9% of the population lived in rural areas in 2011, followed by Spain (7.4% in 2011), Italy (20.2% in 2011) and others. If we refer to one of the developed countries where rural settlements predominate, this is France, which in 2011 had 29.9% of the population in the rural area.

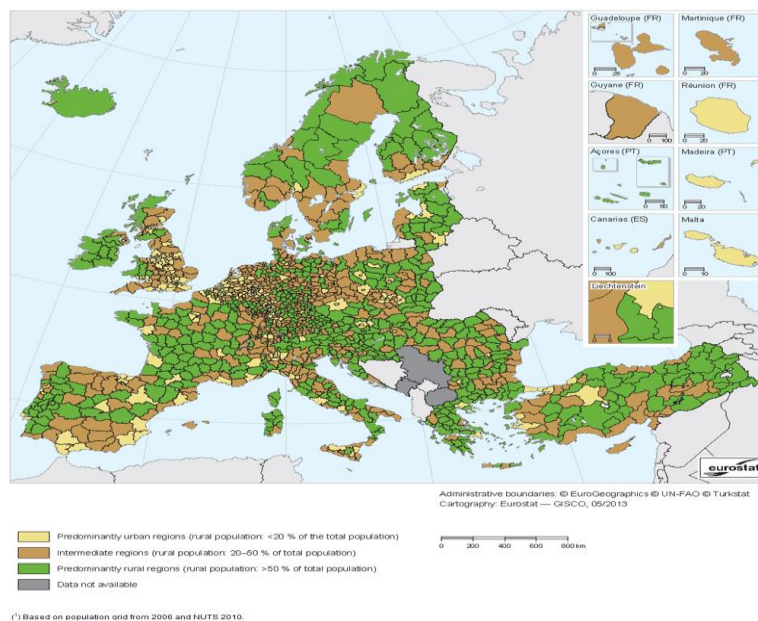


Figure 1. Population distribution in rural and urban areas at European level in 2012
Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Agriculture_-_rural_development_statistics

In the agricultural sector, the main objectives of the Government of Romania concern the following aspects: (i) completion of the land ownership reform; (ii) to provide incentives for the transformation of households into commercial agricultural farms; (iii) setting up a middle class in rural areas; (iv) efficient management of budgetary resources for granting subsidies to agricultural producers; (v) providing support for the capitalization of agricultural production by applying market measures; (vi) development and modernization of communities in rural areas; (vii) sustainable forest management; (viii) the development of fisheries activities; (ix) institutional reform. Agriculture provides a stable economy to a state and at European level the Common Agricultural Policy (CAP) contributes to meeting the food needs of the population by supporting farmers, as well as ensuring food security which a state needs for a decent living.

In Figure 2, are highlighted the information on practice of agriculture, forestry and fish farming at European level, thus the labor force in these fields was only 5.21% in 2012, which leads to a decrease compared to the previous years. These practices are most commonly used in rural areas, as it provides optimal conditions for plant growth / development, fishing and forestry. At European level, this share is low because most geographic areas are part of the urban environment, and the number of rural areas is lower.

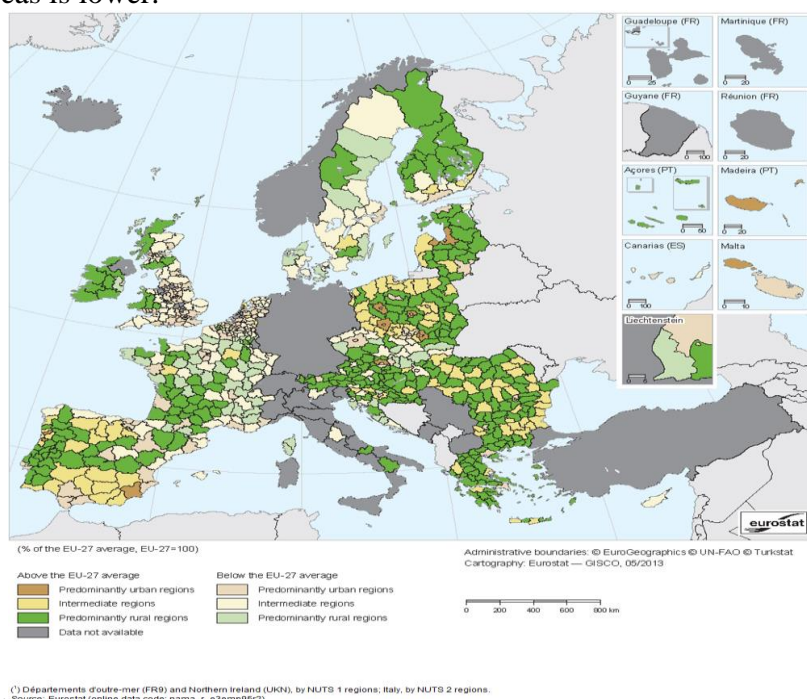


Figure 2. Description of the situation the application of agriculture, fisheries or forestry in European countries

Source: http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Agriculture_-_rural_development_statistics

2.3. Efficiency as a determinant economic indicator of competitiveness

Following adaptation to climate change, agricultural practices have been changed, in particular as regards the technological tools that have led to environmental damage. That is why research is needed based on new agricultural technologies that focus on efficiency and environmental concern because that way profitability can be increased in the agricultural field and can reduce the negative effects on the environment. The socio-economic and biophysical indicators may influence by their applicability, so that practices, policies and strategies can emerge. But, we must also keep in mind that the adoption of government policies has the capacity to change agricultural practices, for example, by using irrigation systems to improve the efficiency of water use and the achievement of significant agricultural output due to the proper management of water needs for agricultural crops.

3. CLIMATIC CHANGES. PRESENT AND FUTURE

The term "climate change" was defined by the United Nations Framework Convention on Climate Change (UNFCCC) which argues that it represents a "climate modification resulting directly or indirectly from human activities, modifying the composition of the global atmosphere". At the same time, the term "human activity" refers to the resulting pollution of industrial activity and other production processes that produce greenhouse gases. In order to evaluate a prediction, Standard and Poor's research has been conducted on the global influence of global climate change and from figure 3 it can be seen that underdeveloped countries will be affected agriculturally and economically by the effects of climate change.

These specialists take into account the vulnerability of a state by analyzing several indicators, namely: the proportion of the population living in coastal areas below 5 meters altitude, the share of agriculture in national GDP and the results of vulnerability indices in each state.

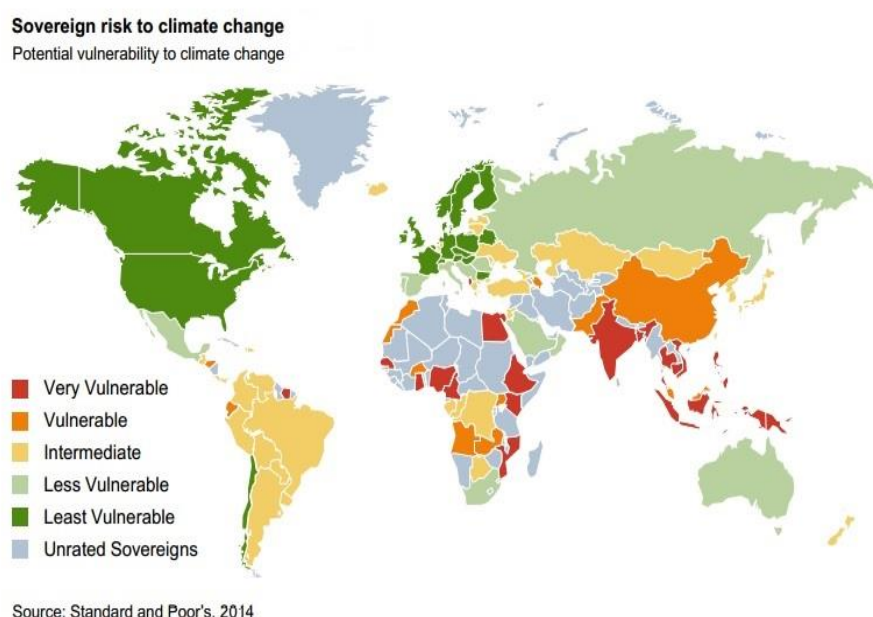


Figure 3. Risk to climate change at global level

Source: Standard and Poor's, 2014

According to the European Environment Agency (n.d.), in Figure 4 the global warming phenomenon was highlighted at European level manifested in the summer season from 2017-2020 compared to 1961-1990 and it can be seen that the index of thermal discomfort it can become hard to bear due to the increase in greenhouse gas emissions. Climate change does not work the same way in all places around the globe, causes and consequences are different, and the countries with a weak economy are more vulnerable to the threat of climate change impacts.

In general, climate projections for the next 100 years a wide variety due to the differences between the answers of the used models and the response interval of the scenarios, and the difference is given by the model chosen to identify these scenarios.

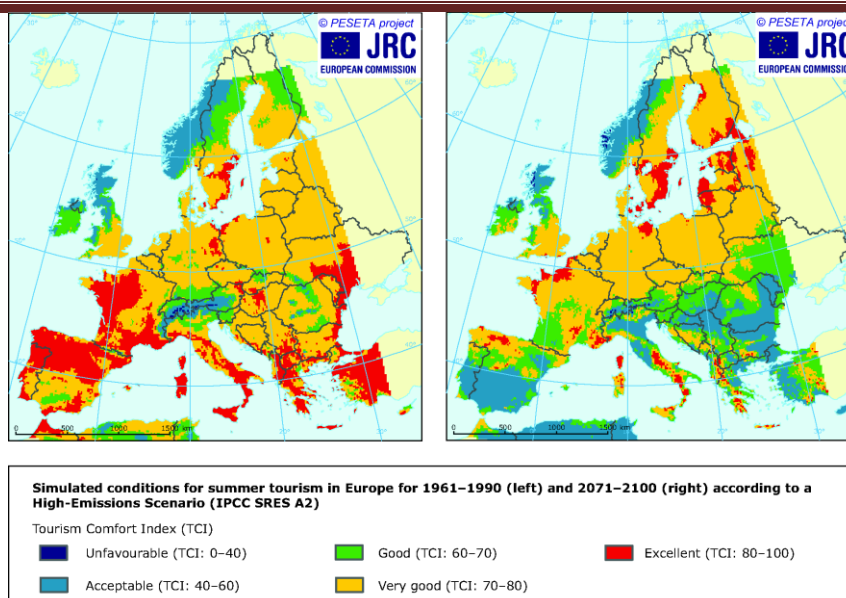


Figure 4. Climate scenarios for global warming at European level during the summer - comparison 1961-1990 and 2017-2100 - index of thermal discomfort

Source:https://www.eea.europa.eu/search?&sort_on=sortable_title&b_start:int=270&SearchableText=climate

4. CONCLUSIONS

In the agricultural sector, the implementation of the measures and achievement of the proposed objectives will continue for adaptation to climate change, but also the reduction of greenhouse gas emissions. At the same time, trying to reduce emissions from the atmosphere is quite difficult to achieve due to increasing population and increasing consumer demands in communities. By applying the right agricultural practices and policy support solutions, it is possible to obtain an efficient water consumption in agriculture, which could lead to higher water resources available for other uses.

With regard to agricultural efficiency in the context of climate change, we must take into account adaptation, which can help significantly reduce the negative impact of climate change. Adapt to these changes contributes to achieving efficiency and increasing agricultural productivity, but also to reduce vulnerabilities and creating new opportunities from which to result positive effects on society.

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